FLIGHT

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OFFICIAL ORGAN OF THE AERO CLUB OF THE UNITED KINGDOM.

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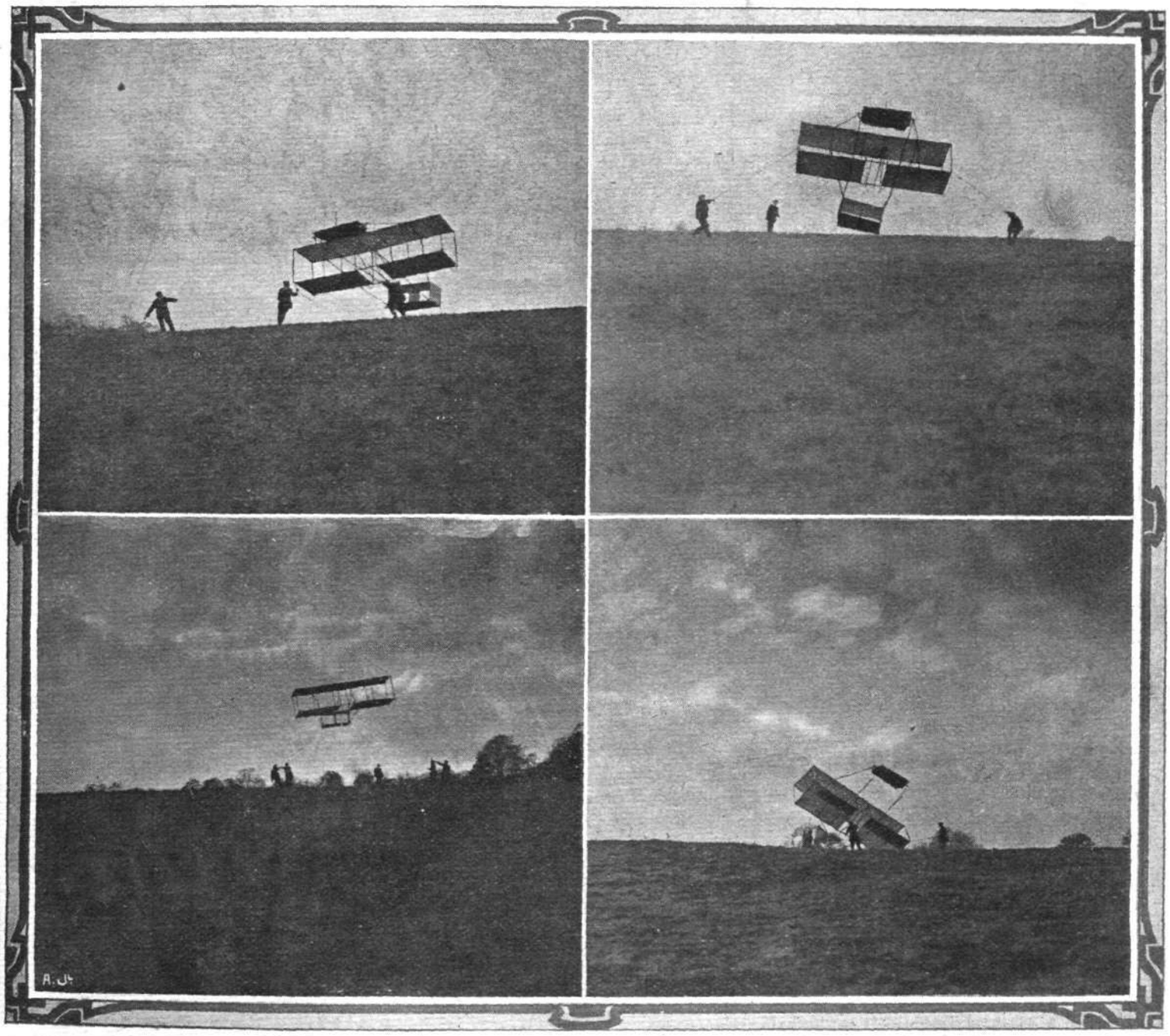


GLIDING EXPERIMENTS.—Mr. A. Sim, who has been making some successful gliding flights, has sent us some valuable hints, in a letter which appears in our correspondence columns, as a result of his experience, accompanied by some interesting photographs, reproduced above. The upper pictures show the glider rising off the ground. On the left, below, a good flight is in progress without the elevator, and, on the right, one of the troubles from which lessons are learnt.

THE IMMEDIATE WAY TO PROGRESS.

Now that the sport of aviation, and therefore the industry of aeroplane manufacture also, is rapidly reaching a comparatively settled stage, and now that a very active season is evidently before us, it is fitting once more to consider the best directions in which to encourage the energy of pioneer pilots for the development of the machines that are destined at an only slightly later stage to bring the sport within the sphere of the *bona fide* amateur owner. During the past year there have been a considerable number of competitions of one kind and another, and although any type of event, or even, for that matter, every individual flight, is instructive and to that extent useful, it has become evident that in order to cultivate both progress and interest at one and the same time, and to the very best advantage, there is room for the display of some amount of discretion in the selection of the kind of competition that is most calculated to serve these ends. Above all, we think it must be recognised that, at the moment, the aeroplane of to-day is somewhat of a forced growth, in spite of the veritable marvels that can be performed with it. It is useless to deny that, even if the actual art of flying is no longer an altogether uncertain matter, yet the construction of the machines still leaves a good deal to be desired as regards the reduction of the risk that is run by those riding upon them. The regrettable accidents by which Senor Fernandez, and now during the past few days M. Léon Delagrange, lost their lives only go too surely to prove these points—even though neither the designers nor the actual builders may have been at fault in either of these cases—while the providential escape of M. Santos Dumont on Tuesday last, when his life also was jeopardised by a similar failure of his mount, clearly betokens a lack of sufficient data as to the stresses and strains encountered by each and every part when in mid-air under the conditions that may there prevail, which can only be supplied by the practical experience now in progress. This matter has a definite and immediate bearing upon the subject under review, because so long as any relatively simple breakages are prone to cause these occasional terribly serious accidents, every competition should, so far as possible, be of the best type to yield the utmost additional knowledge to those who virtually place themselves in the position of professionals, and to the factories from which their machines are issuing—besides simply stimulating and maintaining public interest in the new form of locomotion. Otherwise, indeed, it would be difficult, if not absolutely impossible, to justify the toll—relatively small in proportion to the number of aviators now at work—represented by such painful catastrophes as the death of Delagrange.

Each pilot, it is true, is constantly experimenting and making his own deductions from the behaviour of his machine, while the experience of each aviator is of benefit to his colleagues in the development and improvement of their machines also. In any event, too, constant work of an invaluable nature is in progress at the various aeroplane factories and workshops. But pilot and factory alike must be given as immediate an incentive as it is possible to offer, and if that rapid progress of the flying machine towards perfection which is so vital a matter just now is to be made, prizes must be offered and competitions must be thrown open in reasonably lavish manner. As to the best form which such competitions can now take it is impossible to regard the various "circuses" that have been held in Europe during the past season as altogether satisfactory. It is true they have been useful up to a point, and have served their immediate purpose of edifying a wondering public, but nobody can, we think, contend that they are capable of reaching the limit of utility. Even looking upon them as such, there is certainly ample room for improvement, for it has been said constantly of them that after the first moments of enthusiasm the sight quickly palls. For the good of aviation, in England especially, we must not on any account allow the spectators at an open meeting to feel that the aeroplane is a toy to amuse them for just so long as they choose to be amused. Such meetings, too, are far from satisfying the main requirements of the day that we have already mentioned, for there is far too much of the showman business about the whole thing, and far too little of the systematic and scientific experiment.

Other very different forms of competition—rendered exceptionally interesting to those taking part by virtue of the monetary prizes attached thereto—have been organised, and have either been won or are still open, during the past year or so; and these are, in our opinion, infinitely preferable from every point of view in relationship to the requirements of the time. We refer particularly to those competitions of the Michelin Cup type, wherein a definite performance is required to be made within a specified time, but also to those—and only in lesser degree—in which there is no time limit either within which the actual feat must be performed, or in which there is no fixed prize awarded by the donor for the nearest approach to perfection in some respect within the period fixed. The Michelin Cup, for example, is calculated to encourage enterprise in the most direct and satisfactory fashion possible, for not only was a certain distance of flight prescribed as a minimum below which no performance could qualify for the prize, but interest in the candidates, and their respective attempts for the prize, has not only remained, but the excitement as to the ultimate result for the past year has increased right up to the very last moment, when the most successful competitor carried off the coveted prize, whatever his actual achievement might be. There is nothing to be gained by recapitulating the history of the attempts made for this particular cup during the past year, for our present purpose is merely to draw attention to the superior value of such competitions, and to point out how, by encouraging aviators ever to strive to put up better and better performances as each existing "best" attempt for the cup is exceeded, this type of event has a very direct bearing upon the perfection of the aeroplane as a reliable and practical machine.

Hence, for the reasons given above, we earnestly hope that those to whom it falls to organise competitions, and those who have the satisfaction of benefiting the cause by offering substantial prizes out of the wealth at their command, will bear in mind the potentialities of competitions as mediums of speedy progress. Also, we trust everything possible will be done during the year upon which we have just entered to develop that type of event which we have advocated in particular.

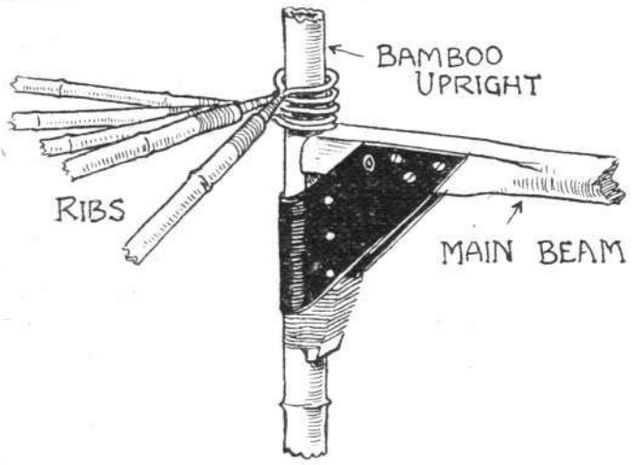
FLIGHT

THE LILIENTHAL AND PILCHER GLIDERS COMPARED.

(*Concluded from page* 8.)

Willow and Bamboo.

THERE is a subtle difference in the construction of these two gliders, otherwise so much alike, which is directly attributable to the difference in the materials employed, for where Lilienthal used willow sticks, Pilcher adopted bamboo. Both had, it will be seen, sufficiently awkward materials to deal with, but Pilcher, it must be



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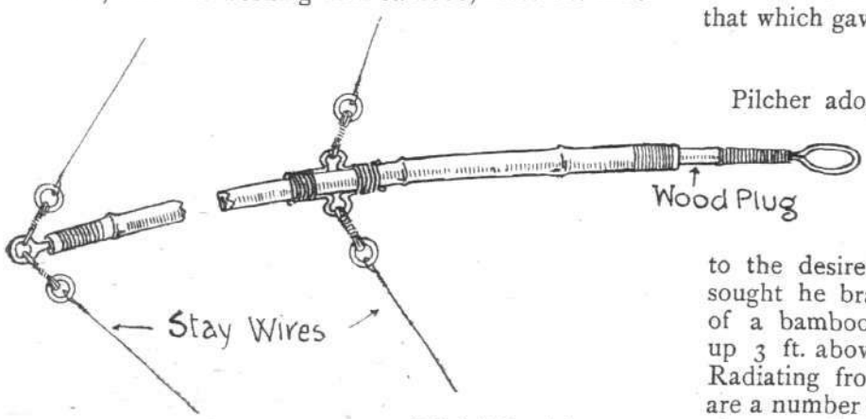
Method of attaching the ribs to the wing standards on the Pilcher glider.

confessed, made a far more engineering-looking job of his work than Lilienthal, whose constructive methods are somehow reminiscent of bent-wood furniture. Both designers embodied the principle of folding-wings in their machines, and thus both were under the same necessity of adapting their construction to suit the special requirements imposed by this important condition. At the same time, however, both had to provide their wings when finished with an artificial camber, and it is particularly interesting to compare the two methods by which these details were accomplished.

The Folding of the Wings.

Pilcher, who was working with bamboo, fitted the inner



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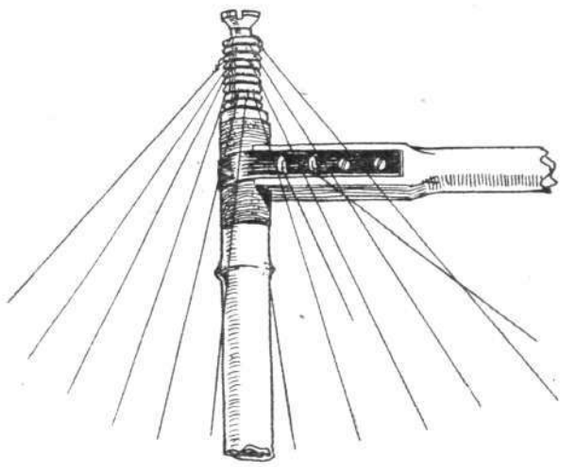
One of the ribs of the Pilcher glider.

extremities of the ribs of his wings with wooden plugs, to which he lashed a loop of iron wire so as to form a ring. These rings he subsequently strung over the central standard, around which each wing spread out like an open umbrella. In order to close the wings, it was only necessary to unlash the attachment between the front edge and the main frame, when the ribs would then all swing round one above the other into any convenient position.

Lilienthal obtained much the same effect, but in his case the ribs folded up side by side, being hinged to a central bracket into which their wedge extremities normally fitted like the spokes of a wheel.

In this machine the hinge centres are 6 ft. apart, and in the Pilcher machine the same points are separated by a distance of 7 ft. 6 ins. In both cases the hinges are joined by a wooden beam, but whereas in the Pilcher glider this member consists of a simple rectangular piece of wood, in the Lilienthal machine it is a built-up structure in the form of the letter X; which system was



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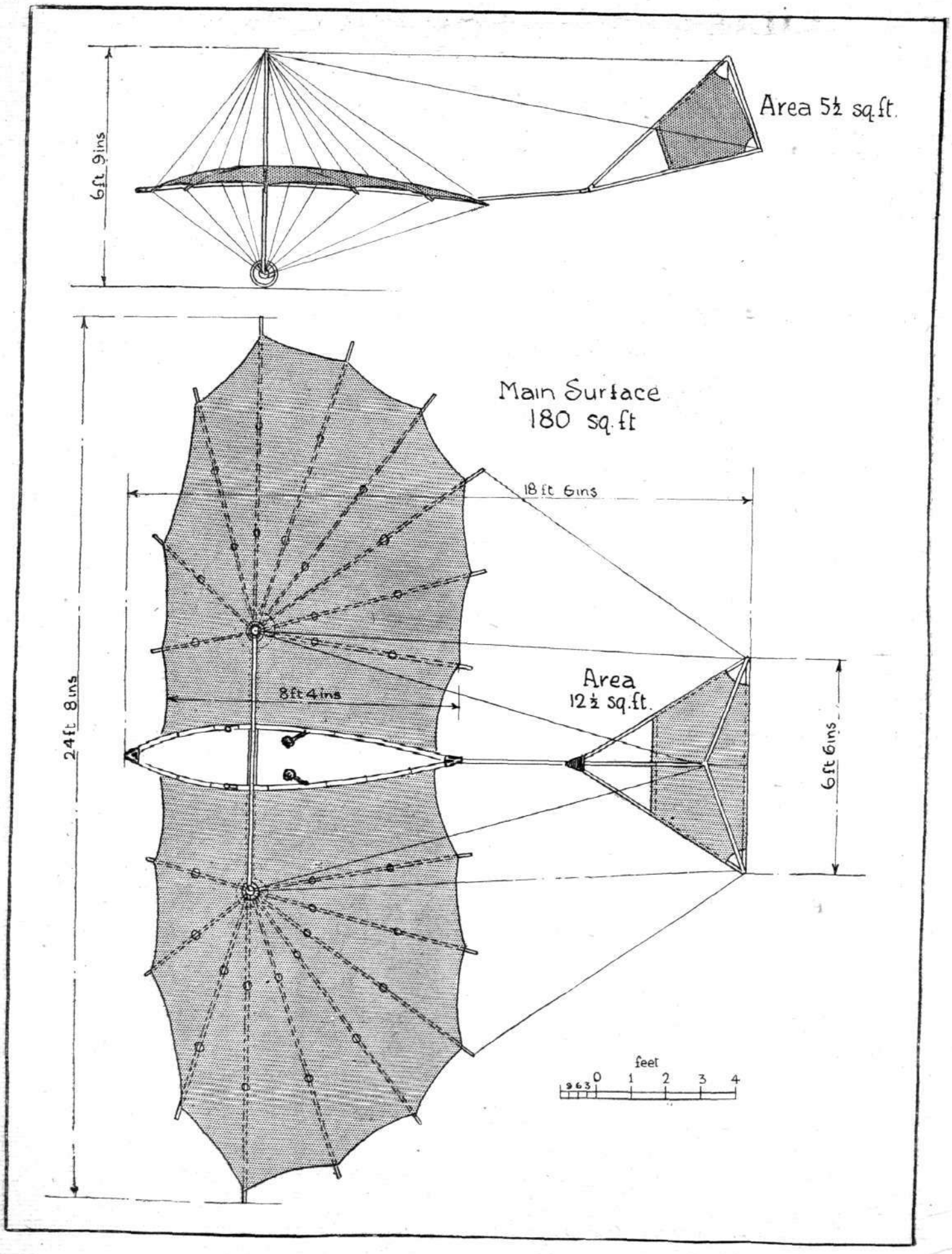
Head of a wing standard on the Pilcher glider, showing radiating tie-wires.

adopted in order to enable the staying of the wings to be conveniently accomplished. It would doubtless have been better had Pilcher attached more importance to the strains on the main beam of his machine, because it was that which gave way during his last glide.

Pilcher and His Wire.

Pilcher adopted a very different method of bracing his wings to that employed by Lilienthal, in fact, it is in this respect that the two machines are most unlike. He relied entirely upon the use of piano-wire for cambering the surfaces of his wings to the desired shape, and in order to get the effect sought he braced each to a central hinge pin consisting of a bamboo pole some 6 ft. in height, which stood up 3 ft. above the deck and projected 3 ft. beneath it. Radiating from the top and bottom ends of this pole are a number of wires, for the most part there are three wires attached above and beneath each rib, only the two front ribs in each wing having less than this number. There are nine ribs in each wing, and altogether 50 wires were required to stay them.

How Pilcher managed to retain all these wires properly taut is a matter for conjecture, but he must have been a man of great patience if he really gave proper attention



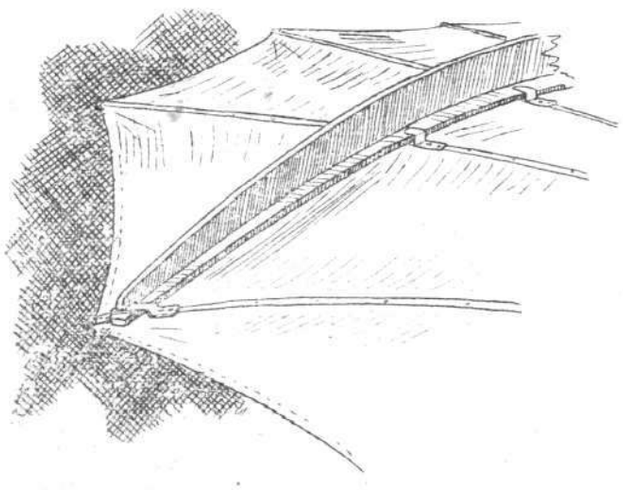
The Pilcher glider.

to each of the 100 wires on which the camber of his surfaces depended. It is no easy matter to adjust wires used for such a purpose, as no sooner is a slack wire tightened up a little too much, than it relieves the strain upon two or three other wires, which become slack in turn. And Pilcher, it must be remembered, worked before the days of those very pretty little wire strainers which commonly form a feature in the bracing of modern flyers, and his method of adjustment must have been as tedious as it was effective. Each of his wires he fitted with a curtain-ring—Pilcher was very fond of curtain-rings—and on the rib he fastened a wire eye. The wires were cut to a fixed length in advance, and calculated to allow about an inch between the ring and the eye when in place. This gap was filled up by a piece of string, passed several times through each member to give the required strength, and by pulling on one end of the string a very minute adjustment could be made in the tension. More curtain-rings were employed for fastening the other ends of the wires to the vertical bamboo poles, so that the wings could be folded without twisting the wires.

Another little device for which Pilcher's construction is peculiar is his method of plugging his bamboo rods with wood. The wood plugs were glued into the hollow ends of the bamboo, which were then carefully lashed with string. Pilcher was very careful about lashing the ends of his bamboo poles as he evidently fully appreciated their liability to split. His use of wire eyes as lugs is another neat detail well worthy of attention, and these little fittings he would also lash in place.

Lilienthal's Stiffening Ribs.

Lilienthal, who very possibly had a natural objection to the use of a lot of wires, hit upon a very ingenious method of doing away with some of them, for he maintained the camber of his wings by the use of detachable supplementary ribs, of which there were four placed fore and aft above the deck. These ribs were strips of wood having an inverted T section, and they were cut to shape so as to serve as templates. As their permanence would have interfered with the folding of the wings, they were fitted in such a manner as to be detachable, and the method of doing this was to fasten small steel clamps on to the primary ribs of the wings, through which the flange of the template could slide. As the wings were naturally flexible there was no difficulty in sliding the curved templates in place from one end, and once in position these members were fastened by little clips. Their purpose was primarily to give the wings the desired camber, although they would of course tend to increase the rigidity of the structure; by their use, the necessity for employing a large number of wires was obviated, in fact, there were only two tie-wires radiating from each of the vertical posts mounted above the hinge plates. Beneath the wings, however, there was a wire to every rib, but even in this respect Lilienthal contrived to do without some 78 wires which Pilcher found necessary.



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Method of attaching the supplementary stiffening ribs on the Lilienthal glider.

Relative Cambering.

It may be remarked that the number of ribs in each of the two machines is identical, viz., 18, but the camber and arching of the wings themselves is distinctly different in the two cases. Pilcher employed an umbrella-like form, in which the camber may be described as being of a uniform character. Lilienthal, on the other hand, flattened the extremities of his wings to such an extent that the curvature of some of the ribs was virtually reversed. The maximum camber on the Lilienthal glider, as on the Pilcher machines, occurs at the hinge of the wing, which on the former is situated 18 ins., and on the latter 2 ft. 6 ins. behind the leading edge. At this point the camber is deeper on the Lilienthal than on the Pilcher glider, but on the Lilienthal machine the camber is almost confined to this point alone, and is far more concentrated, if the term may be used, than in Pilcher's construction.

It is known that Lilienthal experimented with cambers of considerable height in proportion to the chord, and he has stated that the maximum versine (camber) of the wing curvature should be less than $\frac{1}{12}$ of the chord, and preferably only $\frac{1}{18}$ to $\frac{1}{15}$ for considerations of stability.

Both machines had the surface material attached above the ribs.

The Framework.

Having compared the wings and supplementary surfaces, it is of interest to consider the main frames of the two machines, by which we imply that central structure to which the whole is braced, and on which the pilot supports his weight. In the Lilienthal glider this member is of somewhat peculiar form, and is best observed by reference to the accompanying plan; it bears in a marked degree that bent-wood furniture appearance to which we have already drawn attention. One of the principal members is an approximately circular hoop of willow, across which pass in a fore and aft direction two willow rods that ultimately converge at a point where the bamboo tail rod emerges from the wing surface. Transversely across the hoop passes the main beam to which reference has already been made, and immediately behind this an orifice is provided in the surface to accommodate the upper part of the pilot's body. Two small bolsters attached to the frame rest under the pilot's shoulders, and the pilot's arms pass through rests provided for them in the corners of the X-shaped main beam. Just in front of this beam is another transverse rod which the pilot can grip with his hands, and in front of the main hoop member is another bent-wood construction lashed in place with wicker, the object of this device being to act as a fender in the event of collision.

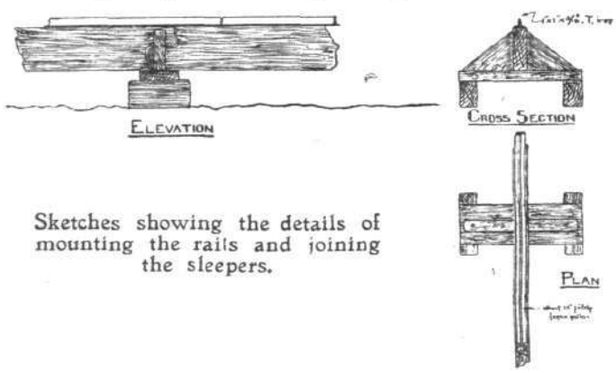
On Pilcher's glider the main frame consists of two bamboo rods spaced 18 inches apart above the main

transverse beam, to which they were lashed in a cradle. Fore and aft these members converge, and are joined together in metal sockets, that at the rear carrying a bamboo extension to the tail. The entire space occupied by the two frame members was left open in the Pilcher machine, in which respect it differs from Lilienthal's glider, where every possible square inch is covered in. The pilot on Pilcher's glider was supported by two small bolsters fitting under the armpits, which bolsters were attached to the ends of short rods projecting obliquely from the sides of the main frame. Thus supported, the pilot's forearms would rest along the frame-members, and flat pieces of wood are lashed in place at these points to give greater comfort. At the ends of these arm-rests two handles project for the pilot to grip.

Both machines are more or less similarly braced as regards the wings to the frame and the tail to the frame; but in the Pilcher glider a transverse wooden strut is provided between the bamboo uprights in addition to the diagonal tie-wires which alone sufficed in the Lilienthal machine. Underneath the frame on Pilcher's glider two bamboo rods project obliquely outwards and carry wooden extensions on which the chassis wheels were mounted. The hollow bamboo is here made use of to contain a spring, and the wooden extension, once more fitted in the form of a plug, in this case became a plunger.

WRIGHT GLIDER LAUNCHING APPARATUS.

IN connection with the description, with scale drawings, of the full-size Wright glider in our issues of September 18th and 25th last, we have been repeatedly asked for details regarding the starting arrangements suitable for such a glider, and now through the courtesy of Messrs. T. W. K. Clarke and Co., we are able to give them. From the side elevation it will be seen that the starting rail itself is about 90 ft. long, while the derrick is 15 ft. high. The actual arrangement shown was that constructed for Mr. Ogilvie's glider at Camber, and there the derrick was made from such timber as was available on the spot, and the starting weight originally consisted of a bag containing the earth excavated from below the derrick. Later this was changed to a number of metal discs up to a total weight of 250 lbs.



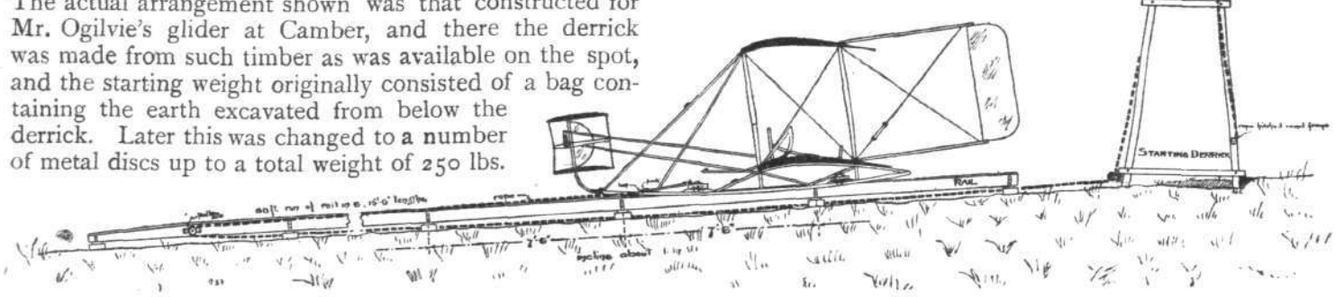
Sketches showing the details of mounting the rails and joining the sleepers.

The rail itself, consisting of "T" iron in 15 ft. lengths mounted on long wooden blocks, was laid on a slope of about 1 in 10, and to compensate for the irregularity of the hillside a clearance of $\frac{1}{4}$ in. was allowed at the joints. Owing to the long grass present in this particular case, it was found necessary to put additional wood blocks 6 ins. deep under the sleepers. The actual details of construction are clearly shown in the three small sketches, while the precise arrangement of the starting-rope can be followed from the side elevation.

In launching, the glider is placed in position close up to the derrick (as shown in the drawing), with its two small grooved trolley wheels resting on the "T" iron rail; the 250 lbs. weight is then raised by hauling on the free-end of the rope, which terminates in an iron ring; this is then slipped over a downwards-pointing iron hook, carried on the end of a wooden bar fixed in front between the skids of the machine. At first a Manila rope, about $1\frac{1}{4}$ ins. circumference, was employed, but a wire cable has since been substituted.

The glider is balanced laterally on the mono-rail by hand on each side (when in motion this is effected by the action of the wing-warping lever), and is held back by hand against the pull of the rope. As soon as the pilot is ready the machine is released, the weight falls, and the glider is shot forward along the starting rail.

When there is a good wind, the machine usually rises into the air after traversing only about 30 ft. of the rail.



Side elevation of starting derrick and rail for full-size Wright glider.

Wright Brothers' Patents.

THE first stage of the legal fight which is evidently bound to rage in the United States, and no doubt later in other countries, round the Wright patents, has been won by the Wright Brothers. On Monday they secured a preliminary injunction against the Herring-Curtiss Co. and Mr. Glenn Curtiss restraining them from making, using, or selling aeroplanes. Moreover, immediately on landing in New York on Monday, M. Paulhan was served with an injunction restraining him from using his Farman machine, which it is claimed infringes the Wright patents.

In giving his decision, Judge Hazel said he found that the warping, yielding, or distorting of the marginal edges of an aeroplane in order to obtain equilibrium is an idea absolutely original with the Wright Brothers, who not only conceived it, but devised appliances to secure a proper balance.

BRITISH AEROPLANE ENGINES.

THE 40-H.P. N.E.C.

THE accompanying photograph shows the inlet side of a 40-h.p. two-stroke four-cylinder N.E.C. aeroplane engine; the other side of the engine is bare of fittings or parts with the exception of the exhaust-pipe, so this view shows practically all there is to see of the engine.

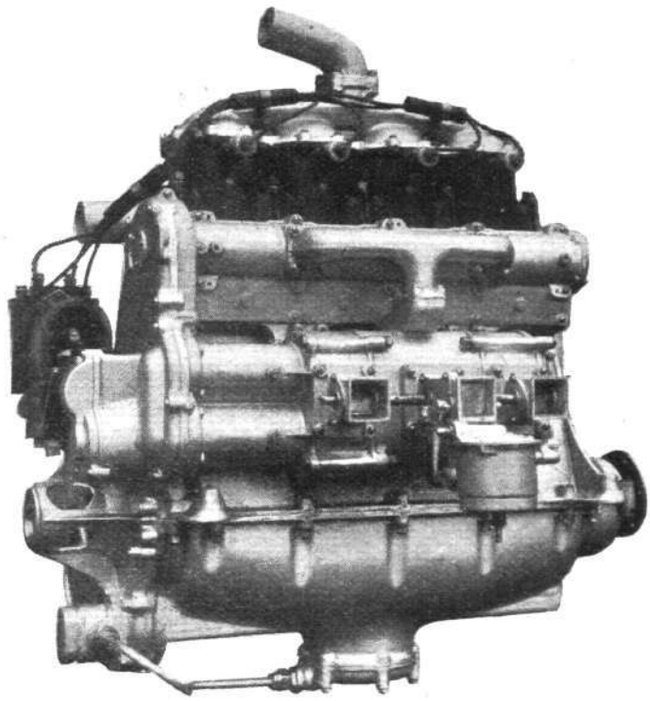
The apparent height of the motor is largely due to its short overall length, for the engine has small dimensions for the power developed, the cylinders being only 3 in. bore by $4\frac{1}{4}$ in. stroke.

The principal point to which the makers draw attention in connection with their engine is that the weight has been kept down without reducing its strength, or reducing the area of the bearing surfaces, or the introduction of doubtful material; the diameter of the crank-shaft, for instance, is $2\frac{1}{4}$ inches. The cylinders and pistons are of cast iron, as in all motor car engines of the present day, and the makers are strongly of the opinion that more satisfactory lubrication is possible between surfaces of this metal than when steel is used.

The N.E.C. engine being of the two-stroke type has no valves in the ordinary sense, the gas passing into the cylinders and the exhaust passing out of the cylinders through very large slots or ports cut through the cylinder walls. It is possible to make the ports in an engine of this kind very large in proportion to the volume of the cylinder, without involving that increase in weight which would accompany very large valves on an engine of the ordinary four-stroke type. The advantage of large valves is that the gas is able to enter the cylinders more readily at high speeds, and there is thus less tendency for the power to be automatically choked off in the way that is sometimes noticeable on engines having valves that are too small.

In the N.E.C. engine the gas is forced into the cylinders by a series of Roots blowers, contained in a box mounted alongside the crank-chamber. The blast from the incoming charge also drives out the exhaust through the opposite ports in the cylinder walls. The process of admission is really divided into two parts, the first period being the admission of fresh air, and the second the admission of gas; the latter only enters the cylinder slightly before the inlet port is automatically covered by the rising piston. This double operation, and especially the timing of the admission of the gas, is a special feature of the N.E.C. engine.

The lubrication of the engine is effected by a pump which delivers oil to all the bearings at a pressure of 25 lbs. to the sq. in. The accompanying photograph



The 40-h.p. 2-stroke 4-cyl. N.E.C. aeroplane engine.

illustrates the position of the oil sump beneath the base-chamber. The particular engine illustrated was arranged for thermo-syphon water circulation, but pump circulation is optional on the two-cylinder and four-cylinder models and is standard practice on the six-cylinder model.

Further particulars, illustrations and drawings of the N.E.C. engines will appear in a later issue of FLIGHT.

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FIRST FLIGHT IN IRELAND.

THE Emerald Isle is not by any means very far behind the times in matters of practical value, and among the several flying machines which have been built and experimented with, that of Mr. H. G. Ferguson, of Belfast, appears to give very good promise of success. So far the work of trying it has been hampered by the lack of a suitable ground, but it is hoped that this will shortly be remedied. It has been located at Lord Downshire's park at Hillsborough, but this, having proved to be too hilly, a move has been decided upon. During the three weeks the monoplane has been at Hillsborough, the weather has been all against practice, but on the last day of the old year Mr. Ferguson, after fitting a new Cochrane propeller, was successful in getting his machine to rise and fly for 130 yards, and this in spite of a gusty wind blowing at an average rate of 25 miles an hour. During this trial Mr. Ferguson had the machine under perfect control and landed again without difficulty. The machine is a monoplane somewhat suggestive of the Blériot cross-Channel flyer, having a supporting surface of 192 sq. ft., the main planes being 34 ft. span. They are mounted with a dihedral angle of 4°, while the angle of incidence when flying is 7°. The length of the machine is 30 ft., and it weighs 620 lbs. It is fitted with a 7 ft. tractor, driven at a speed of 1,200 revs. per min. by a 35-h.p. 8-cyl. air-cooled J.A.P. engine, and a speed of 32 miles has to be obtained before lifting is accomplished. The monoplane was constructed entirely in the works of Messrs. J. B. Ferguson, Ltd., of Belfast, and was designed by Mr. H. G. Ferguson after studying the various aeroplanes which took part in the Rheims and Blackpool meetings. The owner hopes to be the first to fly across the Irish Channel, and moreover to accomplish it before long.

The Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Committee Meeting.

A Meeting of the Committee was held on Tuesday, the 4th inst., when there were present :—Mr. Roger W. Wallace, K C., in the Chair, Mr. Ernest C. Bucknall, Mr. Martin Dale, The Earl of Hardwicke, Prof. A. K. Huntington, Mr. V. Ker-Seymer, Mr. F. K. McClean, Mr. C. F. Pollock, Mr. Stanley Spooner, and Joint Secretaries, Capt. E. Claremont, R.N., and Harold E. Perrin.

New Members.—The following new members were elected :—

Reginald L. Alderson.
John L. Ames.
Alfred Armitage, M.A., J.P.
Frank Amos.
Capt. S. C. G. F. Astell, D.S.O., J.P.
Sir H. B. Bacon, Bart.
Mrs. R. M. Balston.
J. W. Beynon.
L. F. Beynon.
Prof. John Harvard Biles.
Victor Blagden.
B. G. Bouwens.
C. Vernon Boys.
Charles W. H. Brand.
Ernest Brocklehurst.
Rev. Henry Cleeve Brocklehurst.
H. G. Burford.
Ernest J. Coles.
G. Terry Crisp.
E. Ayerst Davies.
Lieut. Gervase Disney.
E. W. Dixon.
Sidney M. Edwards.
C. C. Ellis.
Thomas Grant Fletcher.
P. Neill Fraser.
Roy C. L. Fuller.
Charles Gairdner.
Commander Guy Gamble, R.N.
S. A. Gibbons.
John E. Gibbs.
W. Lawton Goodman.
Col. Grantham.
Maj. F. Egerton Green.
F. Green.
Baxter Greig.
G. H. Greswell.
Lieut. R. H. Clark Hall, R.N.
L. G. Hawker.
T. M. Hawker.
Eric B. Henderson.
C. Shirreff Hilton.
F. H. Hoare-Ward.
Albert Edward Hodgson.
Capt. A. G. S. Hunt.
A. J. Jimenez.
Joseph Jimenez.
John C. Keen.
Capt. L. R. Kelly, R.A.
Lieut. E. St. George Kirke, R.E.
J. G. A. Kitchen.
Miss Dorothy Levitt.
H. H. L. Lewis.
Alexander Macdonald.
Sidney Macdonald.
H. M. Maitland.
E. Manville.
Reginald T. Naish.
Harry Derbyshire Norris.
G. H. Olliver.
W. H. M. Pattisson.
G. Bettesworth Piggott.
Hon. Lady Shelley.
John Sillars.
Lt. H. T. Smith-Dorrien, R.N.
W. John Songhurst.
J. H. Spottiswoode.
R. G. W. H. Stone.
Ernest S. Strong.
Capt. Sueter, R.N.
Capt. C. R. Sylvester-Bradley.
Frederick Cecil Thorn.
Sir John Thornycroft, LL.D., F.R.S.
Howard W. Trollope.
T. P. Wade-Brown.
W. E. W. Wallace.
L. C. Wallach.
John D. Wardrop.
Thomas Winch.
A. C. G. Young.
Clyde Young.

Membership and Subscription.

The Committee of the Aero Club, at their meeting on the 4th inst., decided that after the next election, which takes place on the 11th inst., all new members will be required to pay an Entrance Fee of Two Guineas and an Annual Subscription of Two Guineas.

New Premises.

The Club premises, at 166, Piccadilly, have been removed to the third floor (electric lift). Reading and smoking rooms are provided for members. These rooms occupy a unique position facing Bond Street, and the committee hope that members will now make use of the Club. Refreshments, teas, &c., can be obtained.

International Aviation Meetings, 1910.

A meeting of the Bureau of the Federation Aeronautique Internationale will be held in Paris on Monday, the 10th inst., for the purpose of settling the dates for the International Aviation Meetings or 1910. Mr. R. W. Wallace, the Chairman, and Captain E. Claremont, one of the joint Secretaries, will represent the Aero Club at the meeting.

Aero Club Challenge Cup.

The Committee have awarded the Aero Club Challenge Cup, presented by Mr. John Dunville, to the Hon. Mrs. Assheton Harbord, whose balloon trip, on December 18th, from Battersea to Hagen, Prussia, was the longest journey accomplished during the year 1909. Mrs. Harbord therefore holds the cup until December 31st, 1910.

Death of M. Delagrange.

The news of M. Delagrange's death reached the Aero Club during a meeting of the Committee, and a telegram expressing sympathy was immediately despatched to the Aero Club de France.

Aviation Pilot Certificates.

The Hon. C. S. Rolls and Mr. A. Mortimer Singer having complied with the rules of the Aero Club de France have been granted aviation pilot certificates on the recommendation of the Aero Club of the United Kingdom.

These members are the first Englishmen to obtain pilot certificates in connection with flying machines.

The Aero Club of the United Kingdom are now considering the rules for issuing similar certificates, and these will be published at an early date.

Library.

The Committee of the Aero Club thinking it desirable to form a Library, will be very pleased to hear from any member who would wish to present any books on the subject of aviation.

Pictures.

Several members have kindly presented pictures for the smoke room. Any further presentations will be greatly appreciated.

The Gordon-Bennett Balloon Race.

This race will take place in America in 1910, probably about October.

The Committee of the Aero Club of the United Kingdom will select the three competitors to represent the Club, and intending candidates are requested to notify the Secretary on or before February 22nd, 1910, of their willingness to compete if chosen. Applications must be accompanied by a cheque for £20, the entry fee, which amount will be returned should the competitor not be selected.

Candidates must be members of the Aero Club of the United Kingdom.

The full rules governing the contest can be obtained from the Aero Club of the United Kingdom.

Gordon-Bennett Aviation Cup.

This Cup, in 1909, having been won by America, in accordance with the rules the competition in 1910 will take place in the United States.

In order to comply with the regulations it is necessary, if the Aero Club of the United Kingdom desires to contest the Cup, that the challenge should reach America by 1st March, 1910.

The Committee of the Aero Club of the United Kingdom will select the three competitors to represent the Club, and intending candidates are requested to notify the Secretary on or before February 22nd, 1910, of their willingness to compete, if chosen. Applications must be accompanied by a cheque for £20, the entry fee, which amount will be returned should the competitor not be selected.

Candidates must be members of the Aero Club of the United Kingdom.

The full rules governing the contest can be obtained from the Aero Club of the United Kingdom.

Additional Flying Ground.

The Aero Club have made arrangements with the proprietor of grounds at Eastchurch, to be used as an auxiliary flying ground for their Members. The ground is situated within half a mile of Eastchurch Station on the Sheppey Light Railway, and the same railway facilities will apply as at Shellbeach. The surface of the ground is very level and free from ditches.

A limited number of sheds may be erected on the grounds, and full particulars can be obtained from the Secretaries of the Club.

Designs of sheds must be submitted to the Committee of the Aero Club in the first instance.

E. CLAREMONT, CAPT. R.N.,
HAROLD E. PERRIN,
Joint Secretaries.

166, Piccadilly.

FLIGHT

AERIAL PROPELLERS.

AND SOME POINTS WHICH MAKE THEM INTERESTING.

THE propeller, as we have had occasion to remark before, is a delightfully simple-looking device, except in one or two of its patent forms, but the principles underlying its correct construction are not perhaps quite as generally understood as they might be. They have formed the subject of perennial discussion in engineering circles ever since they were first used on steamships, and it seems by no means unlikely that they will be similarly talked over in their new sphere of flight.

Simple as it is in appearance when made, the propeller does, as a matter of fact, call for a considerable amount of skill and experience in its design, and there is a vast difference in the efficiency between one which has been properly proportioned and another that is apparently only slightly different. It is probably because of the disproportionate results caused by slight discrepancies that so many inventors have assumed that there is a fundamental merit in a particular shape, and it is doubtless largely due to this point of view that so many "patent" propellers have at one time and another been designed. Whatever virtue there may happen to be in any particular form, however, it is very certain that there must be an underlying principle open to the use of all which causes its success, else it would be impossible to proportion the blades to their work in advance.

The Screw and Nut Idea.

Much of the confusion which exists in the lay mind as to the action of a propeller is caused by a too ready acceptance of a very popular simile which likens the action of a propeller to that of a nut in engagement with a screw thread. As the screw rotates so does it progress forward through the nut, and as the propeller rotates, so too, does it advance, for its blades are like small pieces of a screw thread which, by their circular motion, make a complete helix. It happens, however, that the medium in which the propeller works is not solid like the steel of which a screw and nut are constructed, and the consequence is that while the propeller advances it cannot help pushing behind it a rearwardly moving column of air or water as the case may be. This mobile nature of the medium is sufficiently obvious to be recognised by everyone, but, curiously enough, the popular conception of the screw and nut analogy leads many people to argue about propellers as if the "solid state" were actually capable of being attained in practice. They overlook the fact that free fluids like air and water in a state of rest can only offer an abutment to a thrust by virtue of having momentum* imparted to them by the thrust, and since momentum means "quantity of motion" it is a very simple deduction to conclude that it is impossible to propel a vessel, aerial or marine, without setting a stream of the fluid flowing in the opposite direction.

How a Jet Propels.

If a fire-engine were placed on a barge, and the pumps set in action, the whole boat would be propelled by the reaction of the jet, and inasmuch as the picture which this analogy presents to the mind's eye leaves no doubt as to the actual existence of the rearward stream of fluid, it is in many ways a more suitable basis of comparison for screw propulsion than that of likening the propeller to a screw in a nut. Most similes fail at one point or another, however, and the stumbling block in the analogy of the fire-engine is the fact that the nozzle velocity of the jet no longer represents its real rearward velocity in respect to the earth once the boat has been set in forward motion by its action.

The Jet Under Water.

The forward speed of the boat must be deducted from the nozzle velocity of the jet in order to get the effective stern velocity of the water which produces the reactionary thrust; from which point of view it is easy to understand why it makes no difference whether the nozzle be immersed beneath the surface of the river or allowed to play into the air. The boat could never have a forward speed which is quite equal to the nozzle velocity of the jet, because if it did, the column of water in the jet would be stationary to an observer on the river bank; that is to say, each and every particle of it would fall back again into the river immediately above the spot from which it was taken by the pumps, whence it is quite obvious that it can have had no momentum imparted to it and cannot in any way have served as an abutment for a thrust. If the nozzle happened to be immersed on the same level and in a direct line with the pump suction orifice, each water particle would then have been actually replaced in the spot whence it was taken, so that virtually the boat would have merely run over it, although actually each water molecule will, during the passage of the boat, have paid a visit to the pump.

The Propeller as a Jet.

By utilising a screw propeller instead of a fire-engine pump, and placing the propeller in the position of the submerged jet orifice, this useless labour of lifting the water up into the pump would be saved, so that on this score alone there is a certain advantage in the propeller even when it is merely considered as a pumping device. It will send a column of water rearward just as a jet would have done, but the column will be of greater area and will move at a lower velocity, which, as will presently be shown, is an advantage.

That which holds good in marine propulsion may be assumed to be based on fundamental principles which apply also to aerial propulsion, for the air, like water, is a fluid, although different in kind. It is instructive therefore to pursue the theory further in order to try and establish a few specific conclusions and in this case we may begin at once with the propeller as the accepted device for producing a thrust.

(*To be continued.*)

* Readers who wish to investigate the limitations of the Newtonian theory of the continuous communication of momentum, and also the principle of no momentum, will find the subject very clearly treated in Mr. F. W. Lanchester's "Aerodynamics."

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Flying Handicapped in America.

M. SAULNIER, one of M. Blériot's assistants, who has recently returned from New York, says that it is practically impossible to do any flying in that country at present on account of the legal complications arising out of the Wright patents. M. Saulnier, therefore, sold his Blériot monoplane and returned to Paris.

AVIATION NEWS OF THE WEEK.

Flying at Eastchurch.

STILL further progress was made by the Hon. C. S. Rolls on his Short-Wright at Eastchurch on Saturday last, and besides making a long flight with a passenger, he only missed, by five minutes, being included among the few pilots who have flown for an hour. Mr. Rolls went up in the morning and flew round and round, describing circles and figures of eight until he had been aloft for fifty-five minutes, when the miss-firing of the engine rendered a descent advisable. The breeze was very strong, but Mr. Rolls had the flyer under complete control. Later in the afternoon he took up Mr. Grace as a passenger, and flew for 20 minutes. Approximately the distance for the two flights was 48 miles.

The same afternoon Mr. McClean made a short cross-country flight on a similar machine, flying to Short's aeroplane works about three miles from Eastchurch. On the way back a slight mishap caused a hasty descent, but this Mr. McClean accomplished without difficulty.

Aerial League in India.

COLONEL H. S. MASSY, C.B., arrived at Calcutta on December 10th, and commenced a tour of India on behalf of the Aerial League, of which an Indian Branch has just been formed, the presidency having been accepted by the Commander-in-Chief, General Sir O'Moore Creagh. Several enthusiastic meetings have already been held, and Colonel Massy will also give lectures in the most important cities, including Bombay, Madras, Lahore, Allahabad, and Peshawur.

Fletcher Monoplane.

As a result of his study of the various machines at Blackpool, Mr. C. Fletcher has made several modifications in his monoplane, and the reconstructed machine was tested on the 29th ult. in Heaton Park, Manchester. Weather conditions were unfavourable, and trouble was experienced owing to the carburettor freezing, so no actual flights were made. The monoplane is fitted with a five-cylinder Empress rotary engine.

A Blériot Monoplane at Bradford.

ALTHOUGH no very lengthy flights have been obtained, Mr. J. W. House is making very satisfactory progress on the Blériot monoplane on which he is practising at the Halifax Zoo. He hopes shortly to become sufficiently proficient to fly from Halifax racecourse to the Zoo.

Swann Aeroplane.

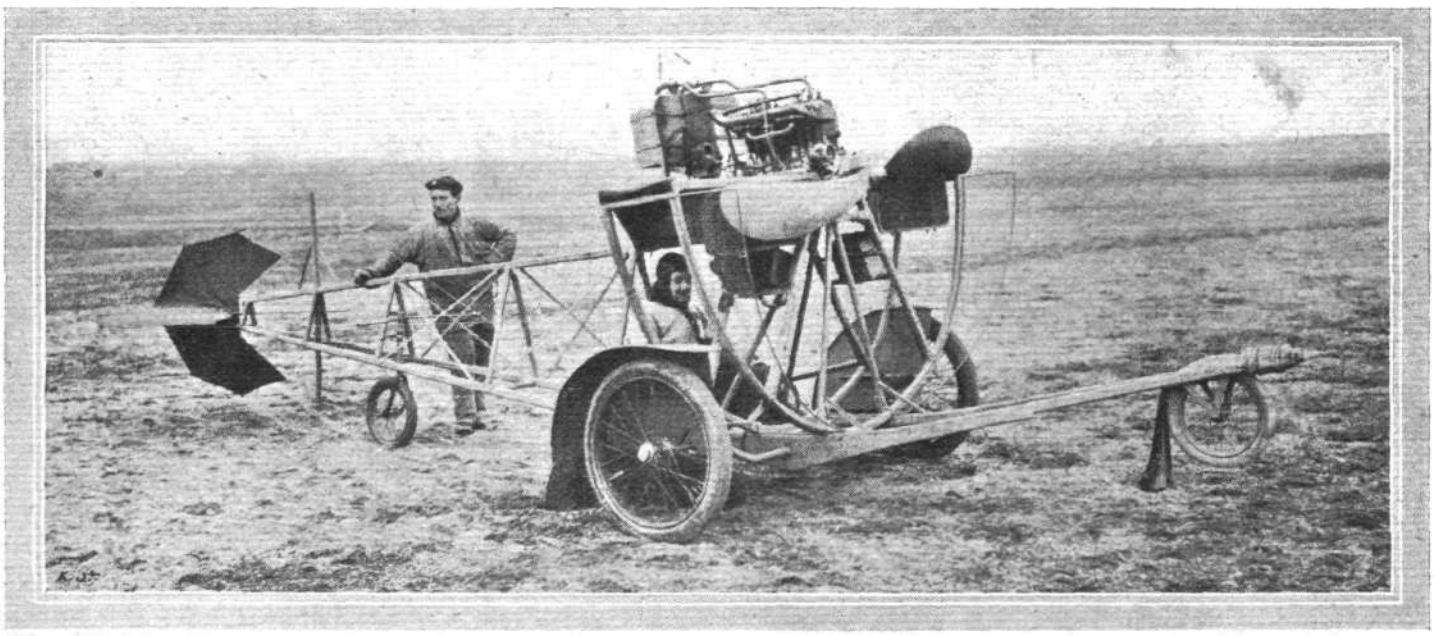
THE Rev. Sidney Swann, who has been experimenting at Aintree racecourse with a monoplane, has now considerably modified his machine and converted it into a biplane. It was taken out for a trial on Monday, but the motor could not be got to develop its full power and the machine did not leave the ground. The steering arrangement seemed to be working perfectly.

Maurice Farman Flies Another Stage.

ON the last day of the old year Mr. Maurice Farman completed another stage of his aerial journey fr 1 Buc to Bordeaux by flying from Chartres to Orleans. The distance was 42 miles (70 kiloms.), about the same as in the first stage from Buc to Chartres, and the time taken was 58 mins. Early in the morning Mr. Farman w s up, and finding the wind very slight, determined to start off as soon as possible. After thoroughly inspecting all parts of the machine, the motor was started and the flyer rose at two minutes to eight. Rising to a height of about 60 metres, Mr. Maurice Farman at once headed for Orleans, and eventually landed in a field by the farm of Bois Gerard, where he was enthusiastically greeted by a crowd of about 500 people. In a few days he intends to fly on to Blois.

Four Prizes in One Day.

ON the 30th ult., M. de Baeder, on his Wolseley-engined Voisin biplane, at Chalons, was successful in winning four prizes. These were the Prix des Pilots, the Prix des Arts et Métiers, the Coupe Archdeacon and the Prix Capitaine Berger. The first two were won by a flight of 3 kiloms., while the Archdeacon Cup was



Messrs. Clement-Bayard, who are constructing the Santos Dumont "Demoiselle" machines, have devised the above ingenious apparatus for the better teaching of novices in the handling of these small flyers. Several ladies are already learning the art of flight in connection with these machines, and an extensive output is likely to result very shortly.

secured with a trip of 8·2 kiloms., beating the old record of 6·5 kiloms. The last prize was won by rising to a height of more than 100 metres, the actual altitude being 107 metres.

Practice at Issy.

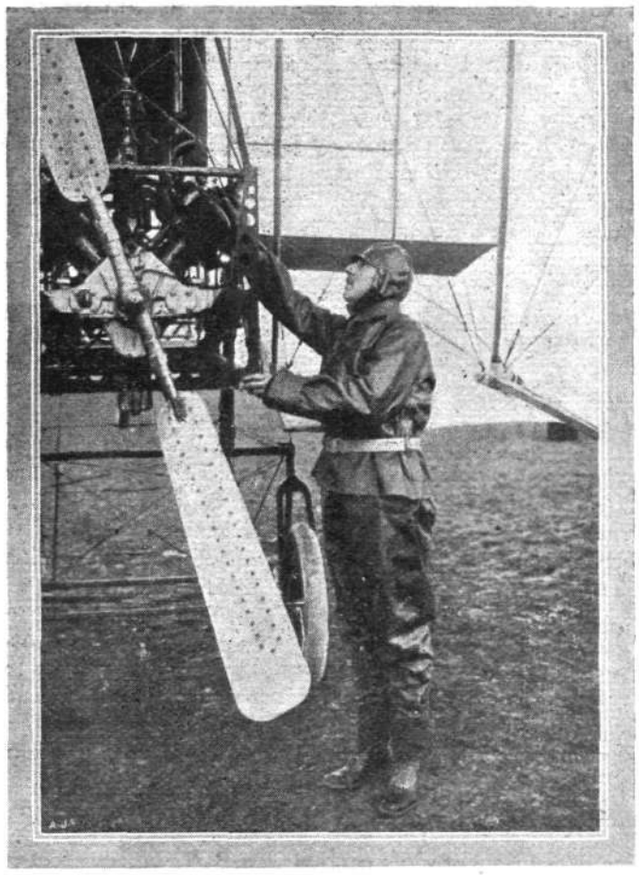
ON the 30th ult., M. Nieuport made several short flights of 100 to 150 metres on the monoplane of his own design, and on the 3rd inst. he had so far progressed in its manipulation as to fly the full extent of the parade ground, rising to a height of 10 metres. During the past week, Mdlle. Dutrieux has been practising on her Santos Dumont "Demoiselle," while Vendome on the Raoul Vendome, Maurice Clement on the Clement-Bayard, and Rougier on his new Voisin have made short trials.

The French Michelin Prize.

ALTHOUGH Mr. Hubert Latham made gallant attempts to secure the Michelin Cup on the last two days of the old year, he was unsuccessful, and so Mr. Henry Farman's record of 4h. 6m. 25s. entitled him to the prize of £800 and the Cup for this year. This record was made on November 3rd, but Mr. Henry Farman was prepared to defend his title, and on the 31st ult. kept flying until such an hour that it became impossible for anyone to beat his record. On the previous day Latham went up, but was compelled to come down after being aloft for 1 hr. 20 mins. He later made two trials lasting 32 mins. and 10 mins. respectively. On the following day, Henry Farman went up at half-past eleven, with sufficient petrol to last for seven hours. He was followed almost immediately by Latham, and they raced together for about 70 mins., when Latham decided to abandon, and Farman decided to come down after two hours and three-quarters, by which time, as we have said, it was impossible for anyone to beat his previous record, and so he wins the Cup, which Wilbur Wright first won on the last day of 1908.

Another Apt Pupil.

IT would seem that the Henry Farman machine is particularly easy to manipulate, for at his first trial alone Van den Born, the old-time champion cyclist, made

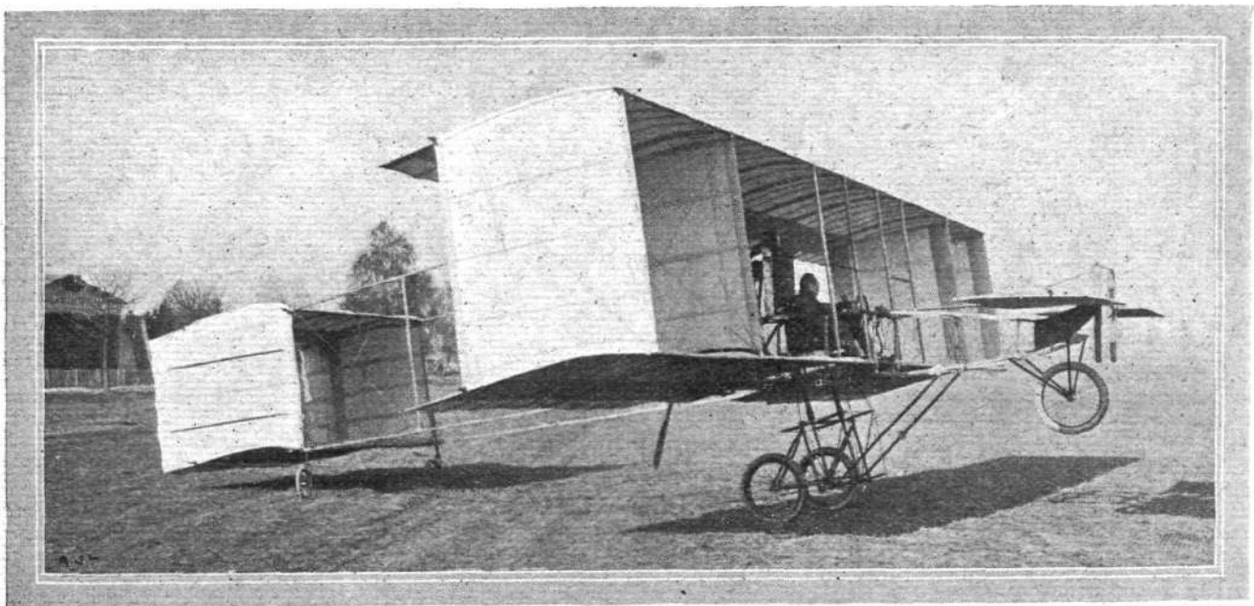


De Baeder, one of the latest successful flyers at Mourmelon, and his Wolseley-engined Voisin biplane.

three flights of 5, 10 and 15 mins., and on the 3rd inst. three trips of 20 mins. and one of 40 mins. were made.

De Lesseps Makes Another Cross-Country Flight.

ALTHOUGH he made another determined effort to win the *La Nature* prize for a 100 kilom. flight across country on December 30th, M. Jacques de Lesseps again had to suffer disappointment. Having had his machine repaired after his last accident, M. de Lesseps started off



De Baeder, who secured several prizes at Mourmelon last week in a single day, on his Voisin machine, which is fitted with a 50-60-h.p. British-built Wolseley engine.

from the Guinette plain, just by Etampes, in beautiful weather, and everything went well until he was about 20 kiloms. from his starting point, just by Angerville. There one of the blades of his propeller flew off, but fortunately the aviator was able to stop the engine before the machine got beyond control. He was successful in gliding to the ground, although the final descent was made somewhat heavily, and the wings and chassis were damaged in consequence.

Mishap at Chalons.

Two mishaps, both through collisions with trees, have occurred at Chalons during the last ten days. The first occurred to de Baeder, who, after winning several prizes on December 30th, decided to try and win the *La Nature* prize for a flight of 100 kiloms. in a straight line. He started off all right, and made a circuit of the ground, but when turning away from the ground in the direction of St. Germains, he was driven against some trees, his Voisin machine being suspended from the branches for some time, with the frame all broken. Fortunately the aviator escaped unhurt.

The second accident befell Baroness de la Roche on Tuesday last. In taking a wide turn she passed over some poplar trees, but misjudging their height, fouled the top branches with the tail of the machine. As a result, the machine was thrown to the ground, and the Baroness sustained several injuries, including a broken collar-bone.

Activity at Pau.

EVERY day has seen several of the Blériot pupils making flights of various lengths. Last Saturday M. and Mme. Blériot paid a visit to the Blériot aerodrome, and M. Blériot could not resist the temptation to mount one of his old machines and make a short flight of about ten minutes. From the masterly way in which he handled the machine, it would seem that his accident has not diminished in any way his natural gift for flying. On the previous day Mr. Claude Grahame White attempted to win a height prize, but for some reason the machine failed when at a height of about 30 metres, and fell to the ground, but fortunately the aviator escaped injury.

Santos Dumont's Accident.

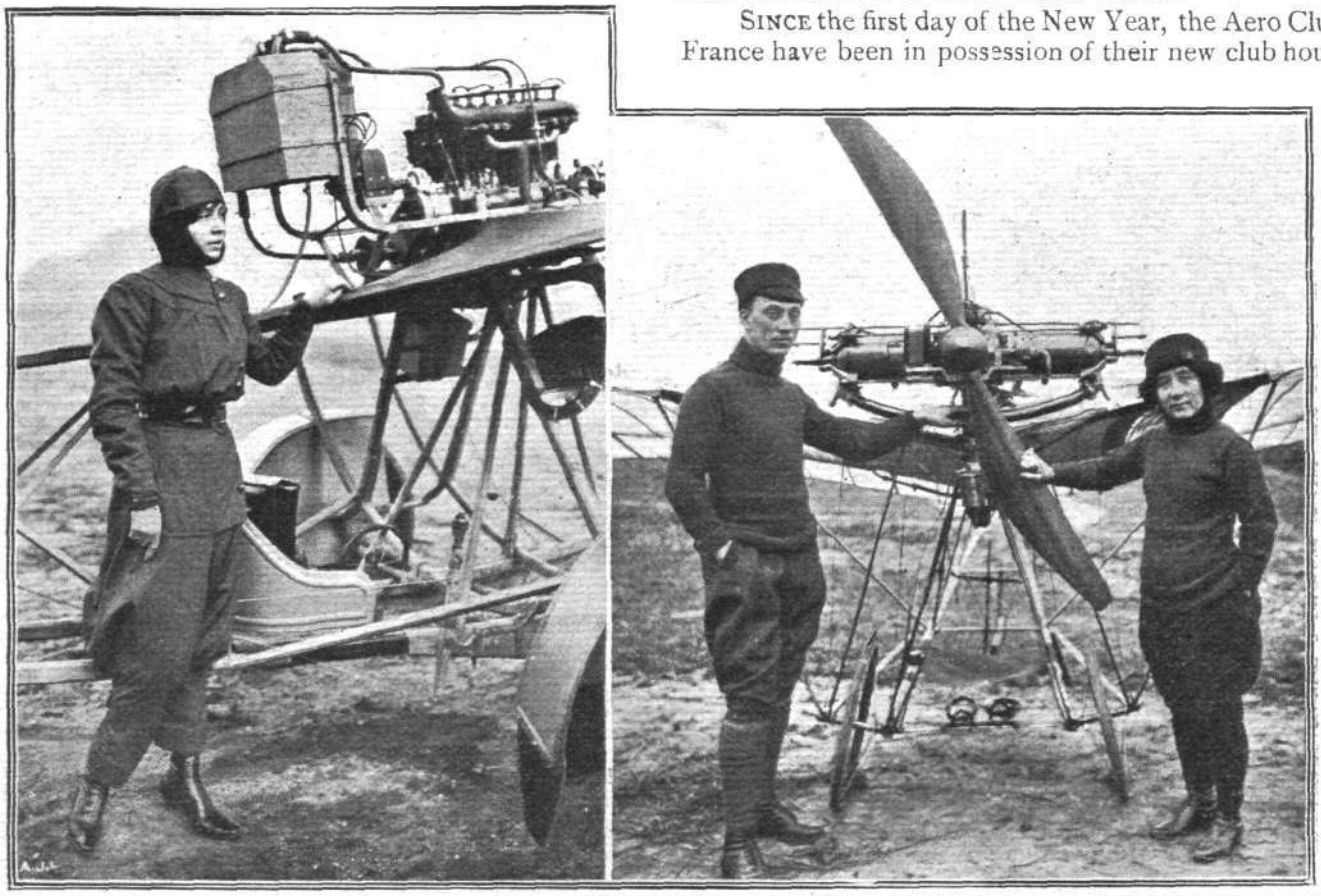
THE accident which befell M. Santos Dumont at St. Cyr, on Tuesday, emphasises the importance of seeing that all stays, &c., are in good condition, especially on monoplanes. Owing to one of the wires snapping while the machine was at a height of 80 ft., one wing collapsed and the machine dropped to the ground. M. Santos Dumont says the machine turned over three times while falling, but he was protected to some extent by the net-work of ropes and wires, and so escaped with nothing worse than bruises to the head and legs.

Women's Monoplane Record Still Open.

IN our issue of December 25th, it was stated that Mdlle. Marvingt had made a flight on a Hanriot monoplane, but we now find that the facts were exaggerated. Mdlle. Marvingt paid a visit to the Hanriot factory and tried one of the machines, but it never rose from the ground, and so the distinction of being the first woman to pilot a monoplane still remains to be claimed. Mdlle. Marvingt is very keen on flying, and is at present being taught by Latham at Chalons.

Ae.C.F. Moves to New Club House.

SINCE the first day of the New Year, the Aero Club de France have been in possession of their new club house at



Two of the lady novices who are learning to fly on the Santos Dumont "Demoiselles." On the left is Mdlle. Dutrieux, in her special aviation costume, standing by the side of the Clement-Bayard novices' apparatus, and on the right are Mdlle. Aboukaïa and Mr. Tod Lane in front of a complete "Demoiselle" flyer. Mdlle. Aboukaïa is well known professionally in Paris and other cities for her daring feats in the past in connection with "looping" on a bicycle (1904) and taking a plunging leap "en automobile" (1906).

35, Rue François I (Champs Elysées), where they will be able to deal more effectively with the rapidly growing work of the club as a society of encouragement, and where there is ample accommodation for the many committee meetings which now have to be held. During the past two or three days delegates have been inspecting the various aerodromes on which it is proposed to hold meetings next year. M. Chauvière has been to Lausanne and Evian-les-Bains, M. Godard to Deauville, and M. Paul Rosseau to Biarritz, Pau, and Rheims.

Flying in Switzerland.

OWING to the accident which befell M. Dufaux's machine a day or two ago, it has been decided to postpone the public demonstrations at the Viry aerodrome to the 9th, 10th, and 11th inst. It is hoped that several other Swiss sportsmen who have recently acquired aeroplanes will be ready to take part then. With a view to encouraging local talent, the journal *A.B.C* has offered a prize of 1,000 francs for the first Swiss aviator to fly 100 metres, and 2,000 francs for the first flight of 2 kilometres. All the local authorities are displaying great keenness to promote the success of the meeting.

A Mishap to Herr Grade.

WHILE practising on the Bork flying ground on the 1st inst. Herr Grade met with an accident which will render it impossible for him to pay his promised visit to Dresden just yet. In endeavouring to make a very sharp turn the left wing touched the ground and brought the machine down with a crash, and Herr Grade sustained some injury to his legs, although it is not very serious.

Copenhagen Flight Meeting.

AFTER having to be postponed for several days on account of bad weather, the Copenhagen flying meeting opened on the 1st inst., when Christiansen, on a Voisin biplane, made three short flights, the longest being for two and a half circuits of the course. Afterwards Svendsen, on another Voisin, flew round the ground twice, but Thory was unable to get the engine on his Blériot to work properly, and so abandoned his trials. On the 3rd inst., in greatly improved weather, much greater success was obtained. Thory covered six circuits of the aerodrome, and easily won the Binet prize of 1,500 francs. Svendsen covered five laps in 11 minutes, and Christiansen also made a short flight.

Flying in Bohemia.

ON January 2nd, M. Gaubert commenced a series of exhibition flights on the racecourse at Prague. They attracted a very large number of spectators, but owing to a derangement of the motor, M. Gaubert was not able to get very satisfactory results from his Wright flyer. His best attempt only extended over 400 metres at a height of about 15 metres.

Cairo Flight Meeting.

THE Aero Club of Egypt have decided that it will be necessary for all aviators who take part in the meeting from February 6th to the 13th to have obtained *pilote-aviateurs'* certificates of the Aero Club of France. Entries will be received from those not so qualified on the condition that they comply with this regulation before the opening date. So far the entries are announced to include Latham, Rougier, Le Blon, Balsan, Mortimer Singer, de Lesseps, and Michelin. Mr. Neale, who recently made one or two short flights at Brooklands on a Blériot monoplane, may possibly be seen on one of Mr. Ballin Hinde's Coventry-built Blériots. Mr. Hayden Sands is also practising on his Antoinette at Cairo.

Flying in Canada.

MR. MCCURDY has again commenced active practice on the "Baddeck No. 2" at Baddeck, and a few days ago flew for about eight miles at an altitude varying between 30 and 250 feet. The weather was extremely cold, and it was this which eventually caused the termination of the flight. Further experiments are to be made over the frozen lakes. Prof. Graham Bell has stated that the machine is now fitted with a motor which should enable it to be run for a whole day, and Messrs. McCurdy and Baldwin are now endeavouring to bring their flying machine to a stage at which it would be of commercial use.

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AIRSHIP AND BALLOON NEWS.

European Aerial Fleets in 1910.

ACCORDING to some statistics published in Germany, the strength of the aerial fleets of the different European Governments during the present year will be: Germany, 14 dirigibles and 5 aeroplanes; England, 2 dirigibles and 2 aeroplanes; France, 7 dirigibles and 29 aeroplanes; Austria, 2 dirigibles and 4 aeroplanes; Russia, 3 dirigibles and 6 aeroplanes; Spain, 1 dirigible and 3 aeroplanes; Italy, 3 dirigibles and 7 aeroplanes.

It is understood that the Belgian Government has ordered the construction of a fourth airship which will be capable of manœuvring for very long periods.

"Gross III" Very Fast.

THE trials of the new German military dirigible, "Gross III," which were carried out on Friday of last week, proved that that vessel is a great improvement upon former German airships as regards speed. During the hour and a half the airship sailed over and around Berlin the speed reached a maximum of 37½ miles an hour. The new vessel is driven by four four-bladed propellers, each actuated by a separate motor. Eight persons were carried during the trip, but it is possible to carry fifteen. Among the improvements is a new design of elevation apparatus in which steering is effected by displacement of water in the rigid frame.

"Zodiac III" Wins a Prize.

ON the 30th ult. "Zodiac III" was successfully piloted over a 150-kilometre course by Count de la Vaulx, and so qualified for the General Meunier prize for the greatest town to town flight accomplished before the end of the year. Starting from its shed at St. Cyr a few minutes after 10, the airship sailed over St. Germain, Pontoise, Meaux, Paris, and Versailles, and reached St. Cyr again at 2.15, having covered the 150 kilometres in 4 hrs. 4 mins.

Gordon-Bennett Balloon Race.

OWING to the fact that a good deal of criticism has been directed to them in consequence of their action in disqualifying the French balloon, "Ile de France," the Swiss Aero Club have issued a statement on the subject. In this it is stated that from the evidence it appears that M. Leblanc and his companion did not make a veritable landing, but jumped from their balloon, judging their lives to be in danger. When the balloon was found it contained enough ballast, in the opinion of the committee, to enable the aeronauts to continue their journey and choose a landing place. Furthermore, the record book was blank, and that was contrary to regulations.

THE FATAL ACCIDENT TO M. LEON DELAGRANGE.

YET another name has been added to the list of martyrs who have sacrificed their lives to the new art of flying, and this time it is one of the "kings of the air" who has been suddenly called to his rest. M. Leon Delagrange, who met with a fatal accident at the Croix d'Hins aerodrome on Tuesday last, was one to whom the flying movement owed a tremendous amount, for he was one of the first to own a Voisin machine as far back as February, 1907, but it was not until the end of that year that M. Delagrange was trying the machine himself. Born in 1870, at Orleans, M. Delagrange was a man possessed of much artistic talent, which found expression in his sculpture, and during the fourteen years he exhibited at the Salon of the Société des Artistes Français, his work won for him several medals. He had an inclination for mechanics, and it was perhaps hardly to be wondered at that the experiments of his former companions at the art school—M. Gabriel Voisin and Mr. Henry Farman—should have aroused his keen interest. In 1906 he designed and ordered a machine from MM. Voisin Frères, which was piloted in its initial trials by one or other of the Voisin brothers. From the time he won the Aero Club of France 200-metre prize on March 28th, 1908, he went forward rapidly, and held the world's distance records from April 10th to June 22nd, 1908, during which time they advanced from 2·5 kiloms. to 17 kiloms. On September 6th, 1908, he was again in front, with a record of 24·7 kiloms., flown in 29 mins. 53 secs. During this time his friendly rival was Mr. Henry Farman, using a similar Voisin machine, and it was the latter who was M. Delagrange's companion in a passenger flight at the end of March, 1908.

In the early part of last year M. Delagrange had some lessons on the Wright machine under Comte Lambert, but he remained true to his old love, the Voisin machine, until September last, when the Blériot monoplane claimed his attention. It was on one of these machines that he appeared at Doncaster, and only as late as December 30th he made a splendid flight on his Blériot, with which he had been experimenting at Juvisy for some time. He then flew for 2 hrs. 32 mins., a record for monoplanes, and in that time he completed 200 kiloms. When it is remembered that the present world's record, standing to the credit of Henry Farman, is only 232·212 kiloms. in 4h. 17m. 53s., it will be seen that it was a splendid performance, easily beating the world's speed records. Two days later he went down to the new aerodrome at Croix d'Hins, near Bordeaux, and on the 3rd inst. made a flight of 15 kiloms. in 8 mins., but found it very difficult to continue owing to the thick fog. The following day he started at half past two, and had made three circuits of the ground when, while executing a turning movement, his left wing suddenly collapsed and the machine fell from a height of about 40 ft. on to one of the hangars. M. Delagrange was thrown out of the machine and killed almost instantly. His death will be a great loss to the movement, for he had had a great experience and with different types of machines. The actual cause of the accident is not clear, but as M. Blériot points out, it may have been caused by the modifications made by M. Delagrange in his desire for improvement. Originally, the monoplane, which was of the cross-Channel type, was built for an 18-h.p. Anzani, but M. Delagrange had replaced this with a 40-h.p. engine, apparently without realising that in doubling the speed of his machine the resistance would be four times as great, and so would strain every part of the frame and stays to the utmost. In France, as in Britain, the calamity has called forth widespread sympathy.

CORRESPONDENCE.

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

NOTICE.—Correspondents asking questions relating to articles which they have read in FLIGHT, would much facilitate our work of reference by kindly indicating the volume and page in their letters.

PROPELLERS AND THEIR POSITION.

[274] In writing to you a day or two ago, I intended to ask you the following questions, and should be very glad if you would answer them for me now :—

1. I see that in all the monoplanes the axis of the propeller is about on a level with the edge of the plane, and in biplanes about half-way between the two. What are the principles governing this position, and what would be the result of placing the propeller either higher or lower?

2. What factors should be considered in fitting two or three blades (or even four) to a propeller? Has a two-bladed propeller any marked advantages or disadvantages as against a four-bladed propeller?

Your advice will be much appreciated.

South Croydon. C. A. RANGER.

[When it is desired to move any object by pushing it or pulling it, it is always advantageous to try and apply the force in a line with the centre of gravity, which, in general, may be taken as the centre of bulk for objects of more or less symmetrical shape. A heavy case lying on the ground, for instance, would not be so readily moved by pushing against the top edge as lower down the side. The reason for this is that the resistance or inertia to movement possessed by the mass of the object itself is virtually concentrated at the centre of gravity, so that when a force is applied to any other point a tilting effect is set up that is distinctly disadvantageous to straigtforward propulsion.

In a flying machine the same general reasoning applies. The axis of the propeller is commonly directed through the centre of gravity, in order that its propulsive effect may not disturb the equilibrium of the machine.

The question raised by our correspondent as to the number or blades that should be used in a propeller is not easily answered in brief. Every blade in the propeller adds so much the more skin friction to the resistance that has to be overcome in rotating the propeller through the air. Other things being equal, therefore, the fewer the blades the better. On the other hand, the object of the propeller is to accelerate a column of air having a diameter equal to that of the propeller itself, and it is essential that at least so many blades should be used as will enable the full screw effect to be maintained. It would appear that two blades are commonly sufficient.

Another fact that ought to be considered is balance. In marine practice three-bladed propellers meet with much favour on this score, but in aeroplane work they are not generally used. Considerations of expense and difficulty of manufacture also, of course, influence design.—ED.]

FLIGHT GOLF.

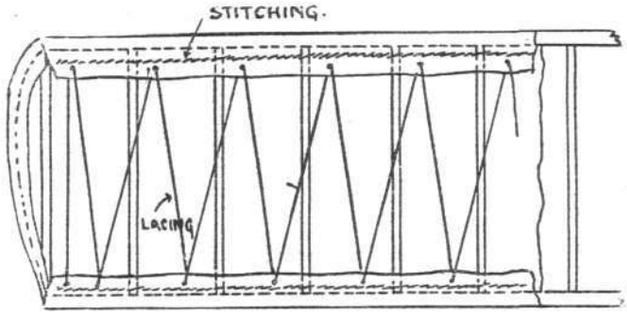
[275] During the holidays I picked up FLIGHT of December 18th, and read that excellent article on flight golf. Now that there are a number of such excellent models made by

amateurs, which have given such successful results, I think the new game should take on. Personally I do not think it will be the model that flies farthest, but the one that is under best control, that will be most successful at the game. I should like to see the views of such gentlemen as Messrs. Smith, C. Fleming Williams, Al n H. Burgoyne, and other such authorities on model flying, in reference to this interesting subject. It seems to me that the energy displayed all round indicates that in this direction the old cry of England being behind will soon die out—especially with the assistance of comparison of results given by such a paper as your own.

A. E. JONES.

SURFACING.

[276] I notice in your issue of December 11th, L. E. Richards wants to know of a method of laying the silk, so I send a drawing



that explains a method I think satisfactory. After sticking, the lacing is cut away.

Blackpool. H. NEWSOME.

MODEL FLYER.

[277] I receive your paper as a member of the Aero Club, and have read with great interest Mr. Horace W. Vaughan's article. During the last few months my brother-in-law and I have been experimenting with a glider of almost identical design, and with very similar results. The frame of our glider was of bamboo throughout, with piano wire stays. It has had plenty of falls, and many struts and stays have been broken from time to time, but these can be easily and quickly replaced. Since September it has been left in the open under an old oak tree, and still is apparently none the worse. We have had several successful flights with a passenger, but the pressure of the wind, acting against the men towing on the ropes, had to be sufficiently strong to enable the glider to support the passenger at the same angle that it assumed when flown without the passenger. Otherwise it would not rise. We attributed this at first to the excessive weight of the tail. To rectify this we added a front elevator, consisting of a single adjustable plane. Greatly to our disappointment this made matters no better. The glider still would not lift except at the same large angle. Further, the increased surface made it impossible to make good progress against the wind unless we had several men on the ropes. Without the elevator two men were sufficient. To try and discover how much pressure was required to maintain longitudinal balance we removed both tail and elevator, and flew the main planes by themselves. To steady and prevent them tipping over, we attached a cord to the middle of the lower back strut. With two men towing the front ropes, and a third regulating the cord from the rear, the main planes flew very steadily. We were greatly surprised at the very small pressure that was required on the cord behind to maintain the planes at the correct angle. This convinced us in the idea that our tail was by far too heavy. We are now building a light tail, with a single plane and a vertical panel on the Santos Dumont principle.

Sundridge Park. A. SIM.

ANSWER TO "PROPELLER."

[278] In answer to "Propeller," I have made a model "Farman" biplane one-eighth size, also one one-sixteenth; the latter flies well with elastic.

I will answer "Propeller's" questions to the best of my ability.

1. I should not think one-ninth size would lift 5 lbs., as this would give only about 3½ ft. across main planes, whereas my 4 ft. plane will not lift 6 lbs.

2. I fastened my planes to framework with Seccotine.

3. I should say a petrol motor would be suitable, but the weight would be too heavy.

4. Yes, plenty of power, but too much weight in my opinion.

5. If a scale model, use a scale size propeller, in your case 10⅝ in.

Shall be pleased to be put into communication with "Propeller."

Bingley. "FARMAN MODEL."

WRIGHT MODELS—SOME QUERIES.

[279] I intend to build a Wright type model biplane, main planes about 40 ins. by 6 ins.; and I wish you could oblige me with the following particulars:—

1. What should be the diameter of twin propellers driven by geared elastic motors?

2. Where can I obtain flat strip rubber about ¼ in. wide?

3. Where can I obtain toothed wheels (small) suitable for gearing elastic motors?

4. How can I reduce the speed of a single-skein elastic motor without loss in power or duration of run?

The toothed wheels should be thicker than ordinary stamped-out clock wheels.

Trusting that this will not occupy too much of your valuable space,

Tunbridge Wells. G. ALCHIN.

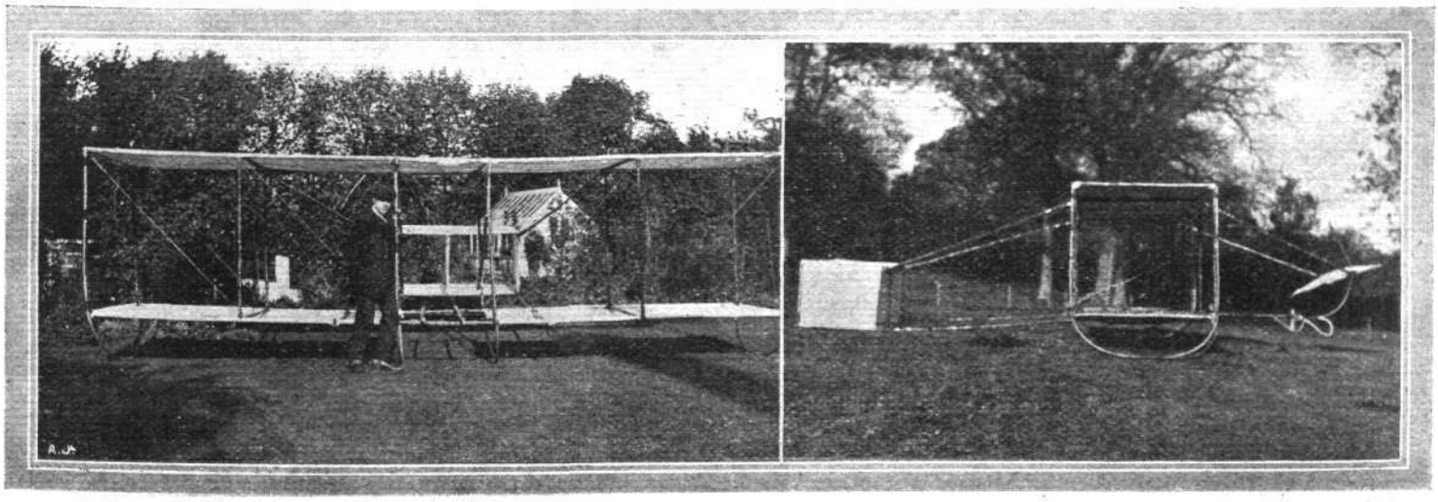
[Possibly some of our readers who may have made models approximately of the same dimensions may be able to suggest a suitable size for the propellers.

Some of the firms advertising in FLIGHT can probably supply our correspondent with the detail parts required.—ED.]

WARPING *V.* AILERON.

[280] Having taken in your paper since its beginning, could you kindly inform me of the following:—

Having two wings 11½ ft. by 5 ft. each, which is the best way of obtaining lateral stability, ailerons or gauchisement (wing warping). The latter seems the simpler of the two. If so, what is the best way to do same, and from what point and how much of the wing does one warp; also, when one edge is depressed, is it necessary that the



MR. A. SIM'S BIPLANE GLIDER.—See also our frontispiece.

other should rise a corresponding amount? Accept my apologies for troubling you.

Newmarket. R. R.

[The relative advantages of wing warping and the use of balancing tips or ailerons is largely a matter of opinion. Possibly the warping if carried out in such a way as to produce true helicoidal deformation of the wings is the more scientific method of making full use of the parts already on the machine. In practice, the wing is commonly warped by deflecting the back spars of the main wings, and in the Antoinette monoplane these spars are pivoted on a common rocking pin to facilitate the movement. When one is depressed the other rises. The entire wing is affected by the movement, but to a varying extent according to the distance from the body of the machine. The effect is to produce a screw surface like the blade of a propeller, hence the term "helicoidal deformation."—ED.]

PAPER-BACKED SILK.

[281] Quite recently I wrote you explaining how difficult Japanese silk was to use in connection with model aeroplane making, and at the same time sought information on this point.

I now find, however, that if a good quality tissue paper—it must be tough—is pasted on one side, it makes an excellent fabric for the purpose, being very light and strong.

Great care must be exercised when bringing the silk (which will be much improved if previously ironed) and the paper into contact, in order to avoid blisters and creases, more especially the latter.

Iron well when dry.

Lowestoft. L. E. RICHARDS.

[Our correspondent has sent us a sample of his paper-treated silk, together with samples of the silk and paper separately. They are most interesting, and it is quite remarkable what a difference the paper makes. Judging merely from appearances we should strongly recommend other readers working along these lines to try the process described in the above letter.—ED.]

FORMULÆ.

[282] As a reader of your excellent paper I sometimes notice formulæ given in the correspondence columns, which I have found very useful in model aeroplane calculations.

Could you or one of your readers oblige me with the following:—

1. A reliable formula for finding the actual *weight* which an aeroplane will carry for a known *thrust* (taking head resistance, &c., into account). I know it should be four or five times the thrust, but that seems rather vague.

2. A formula for finding the *area* of *surface* when the weight, velocity, angle of incidence are known.

3. The right ratio between *surface area* of propeller and that of the aerofoils.

4. Also the most efficient ratio between the *diameter* and *pitch* of a propeller.

I am thinking of making a model biplane of the "Farman" type, and, like some more of your readers, am puzzled to know how to locate the centres of gravity and pressure. They should, of course, fall about one-third the width of the "plane" back from the entering edge, but if, as you suggest in last week's FLIGHT, a thread be hung from that point, the weight of the tail will increase the angle of incidence out of all proportion.

Could you recommend a good modern technical book giving and explaining formulæ relating to aeroplanes and propellers, at a cost of one or two shillings.

Thanking you in anticipation,

Edinburgh. J. DOUGLAS ROSS.

[We would refer our correspondent to our article entitled "Flight according to Lanchester," which appeared on page 292 of FLIGHT, May 22nd, 1909, for information relating to his first two questions.

We are not aware that the problem connected with the third question has yet been studied. For information on the subject of the fourth question, we would refer our correspondent to articles that appeared on pages 22, 350, and 393 of FLIGHT, Vol. I.

If the tail of the machine is designed to support a portion of the weight, its effect must of course be taken into account, but it does not alter the actual position of the centre of gravity of the machine as a whole. Nor does it affect the centre of pressure on the main planes, but it does influence the position of the main planes in respect to the centre of gravity of the machine because instead of being supported at one point it is now supported at two points.

We do not know of any book that would give quite the information that our correspondent requires at the price mentioned.—ED.]

MODEL PETROL ENGINES.

[283] As I notce in your paper, FLIGHT, that several of your readers are inquiring for model petrol engines, I should be extremely obliged if you would insert an announcement in your next issue to say that I should be glad to give details and prices of some models that my engineer is making. They are, I believe, the lightest models on the market, weighing only about 3 lbs. with all accessories, four cylinders, 1-in. bore.

My engineer will be able to show a model working at full power during the course of this week.

Bracknell. DOUGLAS PIGOT.

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